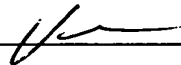


<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371</b>		<b>ATTORNEY'S DOCKET NUMBER</b> 033792R003
		<b>U.S. APPLICATION NO. (If known, see 37 CFR 1.5)</b> <b>10/532674</b>
<b>INTERNATIONAL APPLICATION NO.</b> PCT/CN2003/000867	<b>INTERNATIONAL FILING DATE</b> October 16, 2003	<b>PRIORITY DATE CLAIMED</b> November 1, 2002
<b>TITLE OF INVENTION</b> NANO-TWIN COPPER MATERIAL WITH ULTRAHIGH STRENGTH AND HIGH CONDUCTIVITY AND ITS PREPARATION METHOD		
<b>APPLICANT(S) FOR DO/EO/US</b> Lei LU, et al.		
<p>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a submission under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a submission under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input type="checkbox"/> The US has been elected (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p>a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <p>a. <input checked="" type="checkbox"/> is attached hereto.</p> <p>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input type="checkbox"/> have been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input checked="" type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p><b>Items 11 to 20 below concern document(s) or information included:</b></p> <p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input type="checkbox"/> A preliminary amendment.</p> <p>14. <input type="checkbox"/> An Application Data Sheet under 37 CFR 1.76.</p> <p>15. <input type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A power of attorney and/or change of address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 37 CFR 1.821- 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published International Application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input checked="" type="checkbox"/> Other items or information: Pub. WO 2004/040042, ISR (English/Chinese Language), PCT/IB/308 and Letter Accompanying translation</p>		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering information, preparing, and submitting the completed form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

U.S. APPLICATION NO. (If known, see 37 CFR 1.53) <b>10/532674</b>		INTERNATIONAL APPLICATION NO. PCT/CN2003/000867		ATTORNEY'S DOCKET NUMBER 033792R003	
The following fees are submitted:				CALCULATIONS	PTO USE ONLY
21. <input checked="" type="checkbox"/> Basic national .....\$300				\$ 300	
22. <input checked="" type="checkbox"/> Examination Fee If international preliminary examination report prepared by USPTO and all claims satisfy provisions of PCT Article 33(1)-(4) .....\$100 All other situations .....\$200				\$ 200	
23. <input checked="" type="checkbox"/> Search fee Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority .....\$100 International Search Report prepared and provided in the Office .....\$400 All other situations .....\$500				\$ 400	
TOTAL OF 21, 22 and 23 =				\$ 900	
<input type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is \$250 for each					
Total Sheets	Extra sheets	Number of each additional 50 or fraction thereof (round up to a whole number)	RATE		
14	- 100 =	0/50 =	x \$250	\$ 0	
Surcharge of \$130.00 for furnishing the oath or declaration later than 30 months from the earliest				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	4 - 20 =	0	x \$50	\$ 0	
				\$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$360	\$	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	
SUBTOTAL =				\$	
Processing fee of \$130.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+	\$
TOTAL NATIONAL FEE =				\$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$ 40
TOTAL FEES ENCLOSED =				\$ 940	
				Amount to be	\$
				Amount to be	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ 940 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4300. A duplicate copy of this sheet is enclosed. d. <input type="checkbox"/> Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. Credit card information should not					
NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.					
SEND ALL CORRESPONDENCE TO:			SIGNATURE 		
Dennis C. Rodgers			Dennis C. Rodgers		
Smith, Gambrell & Russell			NAME		
1850 M Street, N.W., Suite 800			32,936		
Washington, DC 20036			REGISTRATION NUMBER		
CUSTOMER NO. 00441					

033792R003

PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Lei LU, et al.

International Application No.: PCT/CN2003/000867

International Filing Date: October 16, 2003

U.S. Serial No.: To Be Assigned

Group Art Unit: To Be Assigned

Filed: : Herewith

Examiner: To Be Assigned

For: NANO-TWIN COPPER MATERIAL WITH ULTRAHIGH STRENGTH AND  
HIGH CONDUCTIVITY AND ITS PREPARATION METHODLETTER ACCOMPANYING ENGLISH-LANGUAGE TRANSLATIONCommissioner for Patents  
Washington, D.C. 20231

Sir:


In reference to the English translation submitted together with the accompanying International PCT Publication, please note that the translation incorporates the following change to the CN-language PCT publication

**On page 3, lines 14-15:**

After cold-working (as-rolled Cu), the tensile yield strength increases appropriately, being about 250 ~~GPa~~ MPa.

Attached with this letter is a print-out of the translated page 3 (line 15) with the version containing the incorrect unit "GPa" (i.e., it matches the PCT publication also containing the error). It is submitted that the unit indication of MPa instead of GPa would be immediately apparent as an appropriate correction to one of ordinary skill, particularly when considering the decimal points associated with the numbers utilizing the GPa and MPa units throughout the application.

Also, the above identified title conforms to that presented in the PCT publication which is referenced in the declaration, while the translation includes an alternate (considered accurate) translation of the title and thus its use in the filing receipt is requested.

Respectfully submitted,  
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1850 M Street, N.W., Suite 800  
Washington, D.C. 20036  
Telephone: (202) 263-4300  
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April 26, 2005

sliding) would be dominate, leading to the softening of materials. Therefore, for nanocrystalline materials, ultrahigh strength can be achieved by suppressing the dislocation activities and the grain boundary activities simultaneously.

Strengthening of solid solution alloying or introduction of a second phase is also effective method in blocking the motion of lattice dislocations. Cold-working (plastic straining), which generates numerous dislocations during deformation process and limits the further dislocation activities, also strengthen the materials. All of these strengthening approaches are based on the introduction of various kinds of defects (GBs, dislocations, point defects and reinforcing phases, etc.), which restrict dislocation motion but increase the scattering for the conducting electrons. The latter will decrease the electrical conductivity of materials.

For example, the tensile yield strength ( $\sigma_y$ ) of the coarse-grained Cu at room temperature is only 0.035 GPa, which is about two orders of magnitude lower than the theoretical strength, and the elongation is about 60%. After cold-working (as-rolled Cu), the tensile yield strength increases appropriately, being about 250 MPa. Nanocrystalline Cu has higher  $\sigma_y$  than coarse-grained Cu. American scientists J.R. Weertman et al. [Sander P.G., Eastman J.A. & Weertman J.R., Elastic and tensile behavior of nanocrystalline copper and palladium, *Acta Mater.*, 45 (1997) 4019-4025] produced nanocrystalline Cu by inert-gas condensation with grain sizes of about 30 nm, and the tensile yield strength is 365 MPa at room temperature. Prof. R. Suryanarayana et al. [Suryanarayana R. et al., Mechanical properties of nanocrystalline copper produced by solution-phase synthesis, *J. Mater. Res.* 11 (1996) 439-448] prepared nanocrystalline copper powder by ball milling, then cold-pressed the purified Cu powder to nanocrystalline Cu with the grain size of 26 nm, it's yield strength is about 400 MPa. However, nanocrystalline samples have very limit elongations, usually less than 1-2%. In China, L. Lu, K. Lu *et al.* (patent application numbered 0114026.7) produced bulk nanocrystalline Cu with the grain sizes of 30 nm by electrodeposition technique. It is indicated that the as-deposited nanocrystalline Cu consisted of small-angle GBs, unlike the large-angle GBs in conventional nanometer materials. The yield strength at room temperature is 119 MPa and the elongation 30%.